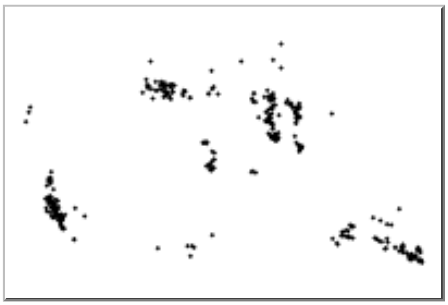
Navajo Nation Abandoned Uranium Mine Centroids with HRS-derived Scores



Data format: Shapefile

File or table name: NN_AUM_Pt_Scores

Coordinate system: Geographic

Theme keywords: Abandoned Uranium Mines, AUMs, Centroid Positions, Hazard Ranking System (HRS), HRS-derived Scores

Abstract: This is a point shapefile of Abandoned Uranium Mine (AUM) centroids developed from AUM Polygons (NN_AUM_Poly_Surf.shp) on or within one mile of the Navajo Nation. Minimal attributes from NN_AUM_Poly_Surf.shp are maintained, including primary and alias mine names, and MAP_ID. HRS scores developed for air, water, surface water, groundwater, and total are joined to this centroid point shapefile. This dataset covers the six Abandoned Uranium (AUM) Regions of the Navajo Nation.

FGDC and ESRI Metadata:

Metadata elements shown with blue text are defined in the Federal Geographic Data Committee's (FGDC) *Content Standard for Digital Geospatial Metadata (CSDGM)*. Elements shown with green text are defined in the *ESRI Profile of the CSDGM*. Elements shown with a green asterisk (*) will be automatically updated by ArcCatalog. ArcCatalog adds hints indicating which FGDC elements are mandatory; these are shown with gray text.

Identification Information:

Citation:

Citation information:

Originators: TerraSpectra Geomatics

Title:

Navajo Nation Abandoned Uranium Mine Centroids with HRS-derived Scores

***File or table name:** NN_AUM_Pt_Scores

Publication date: July 2007

***Geospatial data presentation form:** vector digital data

Publication information:

Publication place: San Francisco, CA
Publisher: U. S. Environmental Protection Agency, Region 9, Superfund Program

***Online linkage:**
\\Terra_dc\Navajo\NAUM_NN_Summary\DB\AUM\NN_AUM_Pt_Scores.shp

Description:

Abstract:

This is a point shapefile of Abandoned Uranium Mine (AUM) centroids developed from AUM Polygons (NN_AUM_Poly_Surf.shp) on or within one mile of the Navajo Nation. Minimal attributes from NN_AUM_Poly_Surf.shp are maintained, including primary and alias mine names, and MAP_ID. HRS scores developed for air, water, surface water, groundwater, and total are joined to this centroid point shapefile. This dataset covers the six Abandoned Uranium (AUM) Regions of the Navajo Nation.

Purpose:

This dataset was developed to support the U.S. Environmental Protection Agency (USEPA) in its undertaking of an extensive scientific study to determine if abandoned uranium mines (AUM) and related mine features pose a significant risk to human health and the environment, and to identify areas requiring action to reduce risk for the Navajo Nation.

***Language of dataset:** en

Time period of content:

Time period information:

Single date/time:

Calendar date: July 2007

Currentness reference:

publication date

Status:

Progress: Complete
Maintenance and update frequency: None planned

Spatial domain:

Bounding coordinates:

***West bounding coordinate:** -111.639811
***East bounding coordinate:** -107.838731
***North bounding coordinate:** 37.409542
***South bounding coordinate:** 35.317281

Local bounding coordinates:

***Left bounding coordinate:** -111.639811
***Right bounding coordinate:** -107.838731
***Top bounding coordinate:** 37.409542
***Bottom bounding coordinate:** 35.317281

Keywords:

Theme:

Theme keywords: Abandoned Uranium Mines, AUMs, Centroid Positions, Hazard Ranking System (HRS), HRS-derived Scores
Theme keyword thesaurus: None

Place:

Place keywords: Navajo Nation, Arizona, New Mexico, Utah, United States
Place keyword thesaurus: None

Access constraints: None
Use constraints:

This dataset includes centroid points for abandoned uranium mines identified on or within one mile of the Navajo Nation. This dataset covers the six Abandoned Uranium (AUM) Regions of the Navajo Nation.

Use of this data generally requires computer workstations with ESRI's Arc/Info (8.x or above), ArcGIS (8.x or above), or ArcView (3.x), or some other GIS or CAD software that is capable of reading or converting this dataset.

The data are provided "as-is," without warranty of any kind, either express or implied.

These data have been compiled as part of a desktop project to collect existing spatial data to support the study of Navajo abandoned uranium mines. No field verifications were undertaken as part of this desktop study.

Point of contact:

Contact information:

Contact organization primary:

Contact organization: U. S. Environmental Protection Agency, Region 9, Superfund Program

Contact address:

Address type: mailing and physical address
Address:
75 Hawthorne St (SFD 8-2)
City: San Francisco
State or province: CA
Postal code: 94105
Country: USA

Contact voice telephone: 415-972-3167

Security information:

Security classification system: None

***Native dataset format:** Shapefile
***Native data set environment:**
Microsoft Windows XP Version 5.1 (Build 2600) Service Pack 2; ESRI ArcCatalog 9.1.0.780

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Data Quality Information:

Attribute accuracy:

Attribute accuracy report:

Attributes values were visually inspected for consistency with source reference documents.

Logical consistency report:

These data were visually inspected for consistency with source reference documents. No field

verifications were undertaken as part of this desktop study.

Completeness report:

This dataset includes centroid points for abandoned uranium mines identified on or within one mile of the Navajo Nation. This dataset covers the six Abandoned Uranium (AUM) Regions of the Navajo Nation.

Positional accuracy:

Horizontal positional accuracy:

Horizontal positional accuracy report:

The centroid is developed as the "center of mass" of each AUM from the NN_AUM_Polys.shp shapefile, using the XToolsPro 3.2 extension for ArcMap 9.1.

The horizontal accuracy from the NN_AUM_Poly_Surf.shp shapefile follows:

NAMLRP sourced AUMs were prepared from sets of 7.5 minute USGS topographic maps (accurate to ~67 feet) for the Navajo Nation with project areas located and identified.

Some AUMs were adjusted positionally or by shape based on DOQQ apparent surface disturbance, DRG mapped mines, and mine maps from literature. The PolySkey field records the source (Skeys) for these sources used to change AUM polygons, The horizontal accuracy for these changes would be taken from the reference source's horizontal accuracy report in its metadata.

Lineage:

Process step:

Process description:

This point shapefile was developed from the NN_AUM_Poly.shp shapefile by exporting the centroids for the AUMs with their attributes to this new shapefile using the XTools Pro 4.1 extension for ArcMap 9.1. The HRS-derived Scoring attributes: Air_Score, Soil_Score, SWtr_Score, GWtr_Score, TotalScore, were joined to this shapefile based upon the relate field "Mine_ID."

The HRS (Hazard Ranking System)-derived model is described first followed by a description of the process used to develop the scores.

HRS-DERIVED MODEL
==========

The EPA Superfund Site Assessment and Technical Support Team selected a subset of HRS criteria to develop screening scores for the AUMs. The purpose of this analytical model is to prioritize Navajo AUM sites using readily available data. The level of detail in this study is not as robust as required for remedy decision making, since the purpose of the screening model is not to determine actual risks, but rather to identify priority areas for future investigation. The EPA team considered probable Navajo exposure pathways as the basis for the model. The large area involved in the assessment falls beyond the normal scope for HRS, so a custom model was developed to best fit these unique circumstances.

Given the unique nature of the task, the EPA team considered the probable Navajo exposure pathways and used 40 CFR 300, Federal Register Notice, HRS Final Rule, December 1990 (EPA, 1990) as the basis for the HRS-derived model. Given the EPA's experience collecting available and pertinent Navajo Nation environmental

data and the large land area under consideration, the EPA decided to conservatively address all known release points (i.e., uranium mines, features, and waste piles), all known streams, all known water wells (domestic, agricultural, and municipal), and all structures (surrogate for residences or where people gather).

Consideration was given to the general fate and transport of radionuclides, as well as probable Navajo Nation exposure assessment scenarios. For example, the scenario of a rural homestead adjacent to an unfenced AUM site where the residents spend considerable waking hours outdoors with access to a nearby surface water source was considered. As a conservative assumption, it was presumed that all water sources may be used for human consumption and that uranium is mobile in dissolved media. For the two water pathways, a simple numeric progression was chosen. A high bias in weighting the soil pathway was used, due to the rural, agrarian lifestyle of the residents. Similarly, a low bias for the air pathway was used, due to the strong winds associated with dispersion effects and resultant difficulty attributing sources.

The method used to prioritize the AUM sites is based on a limited subset of the locational-distance criteria in the HRS. It does not include many of the other criteria and factors built into the HRS model. Therefore, the scores derived under this model cannot be considered to be reflective of an HRS score, but are meant only to begin the process of prioritization based on distance from the AUM source. The algorithm was derived from the CERCLA HRS using the most appropriate distance specific site screening criteria. The HRS-derived model developed for the AUM Project for each of the pathways is listed below.

Air Pathway - 200 feet, 1,320 feet (1/4 mile), and one mile.
• For structures within 200 feet of an AUM site, assign 100 points per structure,
• For structures between 200 feet and 1,320 feet, assign 25 points per structure,
• For structures between 1,320 feet and one mile, assign ten points per structure, and
• If no structures exist within one mile, assign zero points.

Soil Exposure - 200 feet, 1,320 feet, and one mile.
• For structures within 200 feet of an AUM site, assign 100 points per structure,
• For structures between 200 feet and 1,320 feet, assign 25 points per structure,
• For structures between 1,320 feet and one mile, assign ten points per structure, and
• If no structures exist within one mile, assign zero points.

Groundwater Pathway - 1,320 feet, one mile, and four miles.
• For wells within 1,320 feet of an AUM site, assign 100 points per well,
• For wells between 1,320 feet and one mile, assign 50 points per well,
• For wells between one mile and four miles, assign ten points per well, and
• If no well exists within four miles, assign zero points.

Surface Water Pathway - one mile, four miles, and 15 miles.
• For perennial or intermittent surface water within one mile of an AUM site, assign 100 points,
• For perennial or intermittent surface water between one mile and four miles, assign 50 points,
• For perennial or intermittent surface water between four miles and 15 miles, assign ten points,
• If no perennial or intermittent surface water exists within 15 miles, assign zero points.

DATA INPUTS
========

The input datasets are:

ABANDONED URANIUM MINE SITES (AUMs) - NN_AUM_Poly_Surf.shp, source dataset for surface AUMs
NN_AUM_Poly_Surf_Undrgnd.shp, source dataset for surface/underground AUMs

DRAINAGES - NN_Drainage_AUM.shp, target dataset

WELLS - NN_Wells.shp, target dataset

STRUCTURES - NN_Structures_1mi.shp, target dataset

For information on the development of these datasets, see their metadata.

GIS PROCESSING OF HRS-DERIVED MODEL
==========

The following is a general description of the processing used to develop the HRS-derived scoring:

The source and target data listed above were automated into a GIS database. Tabulations to score the pathways were then performed using GIS analysis functions.

A set of buffers were created around each of the surface AUM polygons at the following analytical intervals: 200 feet, 1,320 feet (1/4 mile), one mile, and four miles. This set of buffers was used to perform the surface water, soil, and air pathways analyses. A separate aggregated buffer dataset including a 15 mile buffer was created from NN_AUM_Buffer_Surf.shp.

A set of buffers were created around each of the merged surface/underground AUM polygons at the following analytical intervals: 1,320 feet (1/4 mile), one mile, and four miles. This set of buffers was used to perform the groundwater water analysis. A separate aggregated buffer dataset including a 15 mile buffer was created from NN_AUM_Buffer_Surf_Undrgnd.shp.

The initial tabulation of wells and structures was performed by spatially joining the appropriate set of non-aggregated buffer ranges with each of the two point target datasets (NN_Wells.shp and NN_Structures_1mi.shp).

The spatially joined datasets developed for each intersection of wells and structures with each set of non-aggregated buffers resulted in two spatially joined shapefiles that summed the number of wells and structures within each appropriate buffer range.

The Dbase file for the wells and structures spatially joined shapefiles were imported to MS Excel and used to develop a workbook of spreadsheets that tabulated the count of wells and structures unique to each buffer interval (e.g.,

within the AUM and out to 200 feet distant, 200 feet to 1320 feet distant, etc.) This required, for example, subtracting the count of structures within the quarter mile (1320 foot) buffer from the count of structures within the one mile buffer, because the buffers were developed as the distance from each AUM and not as the distance from each preceding buffer distance.

Summary tables for the Air, Soil, and Groundwater pathways were generated that compile the total number of target features (structures or wells) within each buffer range. The numbers of target features within each buffer range appropriate to the target of interest were then multiplied by the appropriate HRS factor for each AUM on the Navajo Nation, and a pathway score was tabulated.

The surface water pathway was developed using a different methodology because the targets are linear intermittent or perennial drainage features. A count of streams is not an appropriate method because it would result in counting multiple reaches for the same stream. Instead, the presence of a perennial or intermittent drainage within a buffer range was used to establish the scoring.

The field "OneMiOvrln" within the shapefile NN_AUM_Poly_Surf.shp was populated based upon the visual inspection of each AUM along with its one mile buffer in comparison to the NN_Drainage_AUM.shp shapefile, and the appropriate USGS 7.5 minute topographic maps and Digital Orthophoto Quarter Quads. Where a stream was present within in one mile distance in the downslope direction a "yes" was entered, otherwise a "no" was entered. The Dbase file for the NN_AUM_Poly_Surf.shp was exported to MS Excel. A summary table was generated for each AUM site intersecting within one mile overland any drainage within one mile, four miles, and 15 miles.

The MS Excel spreadsheet, NN_Scoring_Tables.xls, provides the documentation and results of the developed formulations.

Combined Pathway Scores were generated by summing the total scores of each pathway for each AUM site within the Eastern AUM Region of the Navajo Nation. These tabulated pathway scores were joined to this NN_AUM_Pt_Scores.shp dataset using the "Mine_ID" relate field. The joined fields are as follows:

Air_Score - Air Pathway Scores
Soil_Score - Soil Exposure Scores
SWtr_Score - Surface Water Pathway Scores
GWtr_Score - Groundwater Pathway Scores
TotalScore - Summed Pathway/Exposure Scores

Process software and version: ESRI ArcGIS 9.1
Process date: July 2007

Process contact:
Contact information:
Contact organization primary:
Contact organization: TerraSpectra Geomatics

Contact address:
Address type: mailing and physical address
Address:
2700 E Sunset Rd, Ste A-10
City: Las Vegas
State or province: NV

Postal code: 89120
Country: USA

Process step:
Process description:
Metadata imported.

Source used citation abbreviation:
S:\Regions\South\DB\AUM\S_AUM_Pt_Scores.shp.xml

Process step:
Process description:
Metadata imported.

Source used citation abbreviation:
S:\Regions\East\DB\AUM\E_AUM_Pt_Scores.shp.xml

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Spatial Data Organization Information:

*__Direct spatial reference method:__ Vector

Point and vector object information:
SDTS terms description:
*__Name:__ NN_AUM_Pt_Scores
*__SDTS point and vector object type:__ Entity point
*__Point and vector object count:__ 602

ESRI terms description:
*__Name:__ NN_AUM_Pt_Scores
*__ESRI feature type:__ Simple
*__ESRI feature geometry:__ Point
*__ESRI topology:__ FALSE
*__ESRI feature count:__ 602
*__Spatial index:__ TRUE
*__Linear referencing:__ FALSE

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Spatial Reference Information:

Horizontal coordinate system definition:
Coordinate system name:
*__Geographic coordinate system name:__ GCS_North_American_1983

Geographic:
*__Latitude resolution:__ 0.000000
*__Longitude resolution:__ 0.000000
*__Geographic coordinate units:__ Decimal degrees

Geodetic model:
*__Horizontal datum name:__ North American Datum of 1983

*Ellipsoid name: Geodetic Reference System 80
*Semi-major axis: 6378137.000000
*Denominator of flattening ratio: 298.257222

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Entity and Attribute Information:

Detailed description:
*Name: NN_AUM_Pt_Scores

Entity type:
*Entity type label: NN_AUM_Pt_Scores
*Entity type type: Feature Class
*Entity type count: 602
Entity type definition:
Abandoned Uranium Mine HRS-derived Scores and Centroids

Attribute:
*Attribute label: FID
*Attribute alias: FID
*Attribute definition:
Internal feature number.
*Attribute definition source:
ESRI

*Attribute type: OID
*Attribute width: 4
*Attribute precision: 0
*Attribute scale: 0

Attribute domain values:
*Unrepresentable domain:
Sequential unique whole numbers that are automatically generated.

Attribute:
*Attribute label: Shape
*Attribute alias: Shape
*Attribute definition:
Feature geometry.
*Attribute definition source:
ESRI

*Attribute type: Geometry
*Attribute width: 0
*Attribute precision: 0
*Attribute scale: 0

Attribute domain values:
*Unrepresentable domain:
Coordinates defining the features.

Attribute:
*Attribute label: Mine_ID

*Attribute alias: Mine_ID

*Attribute type: String
*Attribute width: 50

Attribute:
*Attribute label: AIR_SCR
*Attribute alias: AIR_SCR

*Attribute type: String
*Attribute width: 175

Attribute:
*Attribute label: COMP_SCR
*Attribute alias: COMP_SCR

*Attribute type: Number
*Attribute width: 4

Attribute:
*Attribute label: Chapter
*Attribute alias: Chapter

*Attribute type: String
*Attribute width: 20

Attribute:
*Attribute label: Region
*Attribute alias: Region

*Attribute type: String
*Attribute width: 15

Attribute:
*Attribute label: Map_ID_No
*Attribute alias: Map_ID_No

*Attribute type: Number
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*Attribute alias: Map_ID

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Attribute:
*Attribute label: Soil_Scr

*Attribute alias: Soil_Scr

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*Attribute width: 12

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Attribute:
*Attribute label: Aliases
*Attribute alias: Aliases

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*Attribute width: 10

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*Attribute width: 10

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*Attribute scale: 0

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*Attribute label: Comp_Scr
*Attribute alias: Comp_Scr

*Attribute type: Double
*Attribute width: 12
*Attribute precision: 12

*Attribute scale: 0

Overview description:

Dataset overview:

There are 602 AUM centroid points for the six AUM Regions on or within one mile of the Navajo Nation.

Entity and attribute overview:

There are 9 thematic attributes for this AUM Point Scores dataset:

• Mine ID - arbitrary, unique identifier assigned to each of the AUM site.
• Mine_Name - Primary mine name.
• Aliases - Alias or secondary mine names.
• Map_ID - provides a generally northwest to southeast sequential numeric scheme across the whole of the Eastern AUM Region for presentation in maps of the Eastern AUM Region Screening Assessment Report
• Air_Score - Air Pathway Scores
• Soil_Score - Soil Exposure Scores
• SWtr_Score - Surface Water Pathway Scores
• GWtr_Score - Groundwater Pathway Scores
• TotalScore - Combined (sum total) Pathway/Exposure Scores

See the Metadata Process Steps for more information about the development of the AUM attributes.

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Distribution Information:

Distributor:

Contact information:

Contact organization primary:

Contact organization: U. S. Environmental Protection Agency, Region 9, Superfund Records Center

Contact address:

Address type: mailing address
Address:
95 Hawthorne St (SFD-7C)
City: San Francisco
State or province: CA
Postal code: 94105
Country: USA

Contact voice telephone: 415-536-2033

Resource description: Navajo Nation AUM Region Abandoned Uranium Mine Centroids with HRS-derived Scores

Distribution liability:

Although these data have been processed successfully on a computer system for the USEPA, no warranty expressed or implied is made by the USEPA or its contractors regarding the utility of the data on any other system, nor shall the act of distribution constitute any such warranty. No responsibility is assumed by USEPA or its contractors in the use of these data.

Standard order process:
Digital form:
Digital transfer information:
***Transfer size:** 0.016
***Dataset size:** 0.016

Custom order process:
Contact the USEPA for a custom order.
Technical prerequisites:
Use of this data generally requires computer workstations with ESRI's Arc/Info (8.x or above), ArcGIS (8.x or above), or ArcView (3.x), or some other GIS or CAD software that is capable of reading or converting this dataset.

Available time period:
Time period information:
Single date/time:

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Metadata Reference Information:

***Metadata date:** 20070720

***Language of metadata:** en

Metadata contact:
Contact information:
Contact person primary:
Contact person: Andrew Bain
Contact organization: U. S. Environmental Protection Agency, Region 9, Superfund Program
Contact position: Project Manager

Contact address:
Address type: mailing and physical address
Address:
75 Hawthorne St (SFD 8-2)
City: San Francisco
State or province: CA
Postal code: 94105
Country: USA

Contact voice telephone: 415-972-3167

***Metadata standard name:** FGDC Content Standards for Digital Geospatial Metadata
***Metadata standard version:** FGDC-STD-001-1998
***Metadata time convention:** local time

Metadata access constraints: None.
Metadata use constraints:
None.

Metadata security information:

Metadata security classification system: None

Metadata extensions:
*__Online linkage:__ http://www.esri.com/metadata/esriprof80.html
*__Profile name:__ ESRI Metadata Profile

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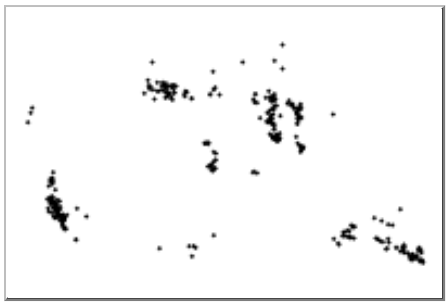
Binary Enclosures:

Thumbnail:
Enclosure type: Picture



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